

THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re the Application of: **Sadao KADOKURA**

Group Art Unit: 1753

Serial Number: **09/998,235**

Examiner: **Steven H. Versteeg**

Filed: **December 3, 2001**

PTO Confirmation No.: **5061**

For: **FACING-TARGETS-TYPE SPUTTERING APPARATUS AND METHOD**

Attorney Docket No.: **011516**

Customer No.: 38834

INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendments

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

June 3, 2004

Sir:

The attention of the Patent and Trademark Office is hereby directed to the documents listed on the attached Form PTO-1449. One copy of each of these documents is attached.

This Information Disclosure Statement is being submitted after issuance of a first official action on the merits and expiration of the three month period following the filing date or the entry of the national stage for the above-captioned application, but prior to issuance of either a final official action or a Notice of Allowance. A check is attached hereto which covers the \$180.00 fee set forth in 37 CFR § 1.17(p).

The above information is presented so that the Patent and Trademark Office can, in the first instance, determine any materiality thereof to the claimed invention. See 37 CFR 1.104(a) concerning the PTO duty to consider and use any such information. It is

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U.S. Patent Application Serial No.: 09/998,235
Information Disclosure Statement filed June 3, 2004

respectfully requested that the information be expressly considered during the prosecution of this application, and that the documents cited in the attached Form PTO-1449 be made of record therein and appear on the first page of any patent to issue therefrom.

The Commissioner is hereby authorized to charge any additional fee (or credit any overpayment) associated with this statement to our Deposit Account No. 50-2866.

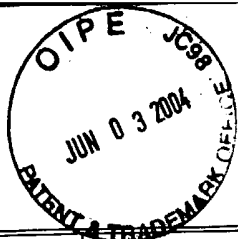
Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP

By: 
Scott M. Daniels
Reg. No.: 32,562
Attorney for Applicant
Tel: (202) 822-1100
Fax: (202) 822-1111

Attachments: Fee - \$180.00
Appendix – Abridged Translations for Japanese Patent Documents
PTO Form 1449 w/11 references

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| INFORMATION DISCLOSURE CITATION PTO-1449 | Atty. Docket No. 011516 | Serial No.: 09/998,23 |
| | Applicant(s): Sadao Kadokura | |
| | Filing Date: December 3, 2001 | Group Art Unit: 1753 |

U.S. PATENT DOCUMENTS

| Examiner Initial | | Document No. | Name | Date | Class | Subclass | Filing Date (If appropriate) |
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| | | | | | | | |

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| Examiner | | Date Considered |

APPENDIX

ABRIDGED TRANSLATIONS FOR JAPANESE PATENT DOCUMENTS

H06-330305A

[0023] Example 1

Using facing target sputtering apparatus shown in Figure 1 wherein targets are made of pure iron, a glass substrate is set, a magnetic field is applied so that the magnetic flux density of the central part between targets may become 300 gauss, a sputtering power of 2kW of 13.56-300MHz of high frequency electric power and 0.3kW of direct-current electric power is supplied on each target, and argon is supplied as sputtering gas at the pressure of 1 mTorr, a pure iron film is formed on the glass substrate kept at 50 °C, and the saturation magnetic flux density and coercive force are measured. However, the above mention includes the case of the 13.56 MHz high frequency electric power which is used at the conventional method.

2000-319778A

[0022] A discharge electric power for forming plasma is supplied on a pair of facing ring-shaped targets 7a. Generally, a direct current or a high frequency electric power of about 13.56 MHz is supplied. However, an AC power of VHF of 10MHz or more high or several 10 Hz, or a superimposed power of high frequency and DC or pulse of KHz or so can be applied depending to the purpose. Generally, DC is used when target 7a is metal, and high frequency is used in the case of insulating material such as dielectric or semiconductor.

H11-193459A

[0047] Moreover, as for this invention, one electric power supply means may supply direct-current electric power and the other may supply

alternate-current electric power. In this case, in order to prevent the trouble caused by alternate-current electric field's interference in direct-current electric field by the target side supplied with direct-current power, it is desirable to provide a non-illustrated control circuit and prevent the occurrence of arc electric discharge.

H05-140741A

[0025] In addition, with the facing target sputtering apparatus, the plasma density becomes high in the central part of a target, and the central part of the target tends to be eroded selectively. However, by this invention, since the 2nd magnetic field generating means has been arranged near the perimeter of a target, the magnetic field of the circumference part of the target becomes strong relaxing that plasma density in the central part of the target becomes high, and the erosion of the target becomes uniform. For this reason, an advantage of increasing target use efficiency can be obtained, too.

H11-080944A

[Claim 6] A sputtering apparatus according to claim 5, wherein said sputtering portion is a box-type target unit configured so that all the sides are closed, except for a side facing the substrate.

H11-310874A

[0063] And it is desirable that the targets T1, T2, and T3 used for this invention are made of the same material. As a target used here, a single metal such as aluminum, titanium, tungsten, chromium, copper, molybdenum,

platinum, tantalum, etc., an alloy such as aluminum-silicone-copper alloy etc., a semiconductor such as boron or phosphorus doped silicon etc., rare earth metal, an oxide such as ITO , silicon oxide, aluminum oxide, etc. or nitride such as aluminum nitride, titanium nitride, tungsten nitride, silicon nitride, etc. is advantageously used.

[0088] Example 2

Next, LC2040, a product of Sanyo Chemicals, thermosetting resin used for a flattened film to make a liquid crystal color filter, is spin coated $1.1\mu\text{m}$ thick on a glass substrate of 1.1 mm thick and 300mm square. Then an AlSiCu alloy film is formed by using the facing target sputtering apparatus of this invention and the conventional facing target sputtering apparatus, like example 1 and comparison example, only exchanging AlSiCu target from Cu target, keeping the substrate 30 mm away from the top of the target as in the former examples. At that time, "temp-plate", which is a temperature measuring device using color change made by Wahl, Inc., was stuck on the back side of the substrate, and temperature rise of the substrate was measured.

H10-265949A

[0019] In the case of an aluminum target or a titanium target, although the result that it is easy to produce an electric discharge is obtained and sputtering is able to start with comparatively low-pressure, it is necessary, conversely, to keep the pressure of more than $4.0 \times 10^{-2}\text{ Pa}$ to maintain stable electric discharge.

H09-272973A

[0035] The parallel magnetic field intensity in the position where the perpendicular magnetic field intensity on the target in the equipment shown in Fig. 1 becomes zero, and the pressure where an electric discharge starts and the minimum pressure where electric discharge can be maintained are shown in Fig. 9. It is obvious from Fig. 9 that the pressure at which electric discharge starts and the minimum pressure at which electric discharge can be maintained are nearly constant (the minimum value) if the parallel magnetic field intensity on the target is larger than 200 gauss. For example, when an aluminum target with a diameter of 100 mm is employed, the minimum pressure for maintaining electric discharge of 3×10^{-2} Pa is obtained by -800V applied and the parallel magnetic field intensity of 200 gauss.